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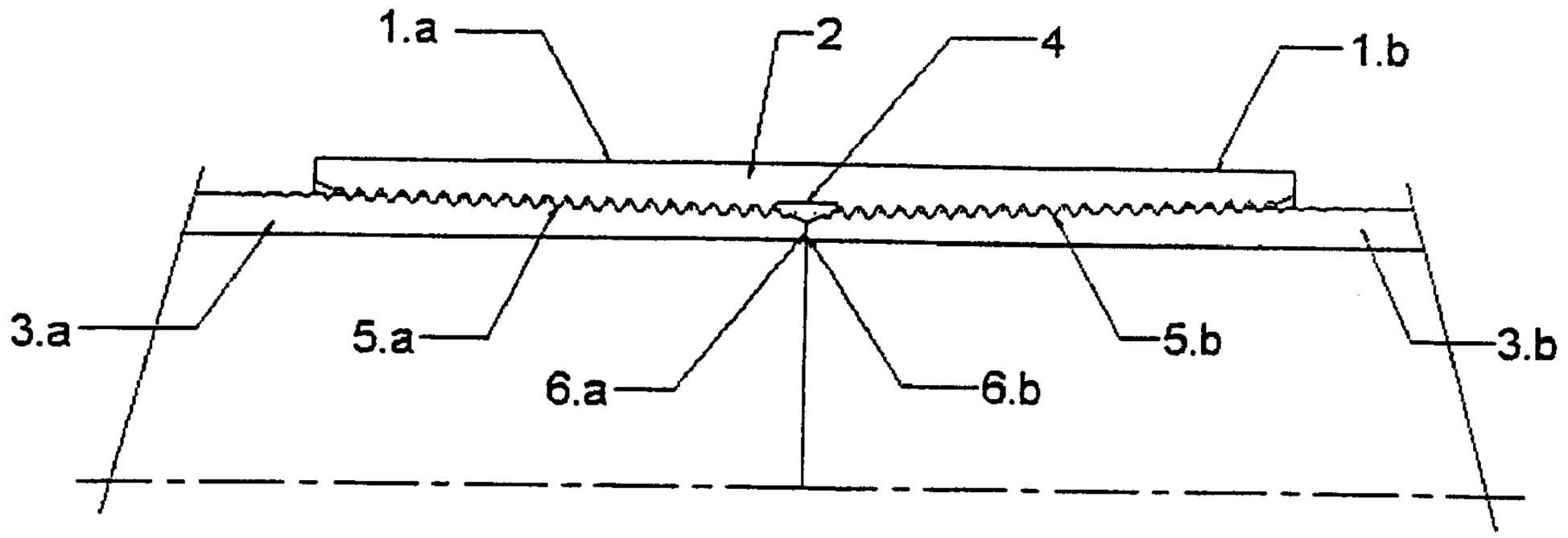
(54) Title: HIGH-RESISTANCE THREADED JOINT



(57) Abrégé/Abstract:
The present threaded joint comprises a coupling or threaded member in its internal surface in both of its ends -female- which joins a pair of members, each of them bearing external threads -male. The union between male and female ends is produced by means of the threaded surface. This joint is characterized in that the axial length of each male end is increased as compared to conventional joints. Further, each male end bears, on its free end at the vicinity of the threaded surface, an annular surface situated perpendicularly as regards the joint axis, such that once joined to the female end, said annular surface contacts the homonymous annular surface of the other male end which joins the other female end. Through the combined action of both effects, a higher resistance against joint jump-out upon combined loads action (bending, tensile, etc.) is achieved.

ABSTRACT

The present threaded joint comprises a coupling or threaded member in its internal surface in both of its ends -female- which joins a pair of members, each of them bearing external threads -male. The union between male and female ends is produced by means of the threaded surface. This joint is characterized in that the axial length of each male end is increased as compared to conventional joints. Further, each male end bears, on its free end at the vicinity of the threaded surface, an annular surface situated perpendicularly as regards the joint axis, such that once joined to the female end, said annular surface contacts the homonymous annular surface of the other male end which joins the other female end. Through the combined action of both effects, a higher resistance against joint jump-out upon combined loads action (bending, tensile, etc.) is achieved.

HIGH-RESISTANCE THREADED JOINT

This invention relates to joints which connect tubular members, e.g. pipe-lines tubes used for the conveyance of pressure fluids such as vapor or oil by-products. It may also be applied to tubes used for the conveyance of pressure fluids, such as vapor, gas or petroleum, for instance those involved in the exploration or production of gas or oil.

At present, threaded joints consist of a member which bears an internal threaded surface at its two ends -female- and two members with threaded external surfaces -male- which coincide with the female member threaded surfaces so that said members are joined by means of said threaded surfaces. Currently used joint is that described in Standard API 5B.

This kind of joint has a limited length thread, which upon a solicitation by tensional and/or mixed stresses (bending/tension) produces disengagement thereof or drawing of thread fillets due to shear stresses. The first of the above mentioned failures is the most frequent in this kind of joint.

Another characteristic of current joints is that there exists a discontinuity of the fluid current circulating within the tube which bears the threaded joint, as there

exists a protrusion between the internal surfaces of male ends and internal surface of the female member.

It is the first object of this invention to provide a threaded joint which features an improved performance as compared to current joints, eliminating a jump out likelihood and increasing its shear resistance when subject to tensional and/or mixed bending and tensional loads. A further object is to define a threaded joint with the above mentioned characteristics, with thickness ranges not covered by current joints.

Yet another object of this invention is to provide a joint able to inhibit the production of substantial alterations as regards the current line of the fluid circulating through the interior thereof.

Yet another object of this invention is to provide a joint able to be readily assembled to its operation means, using plain tools, including hand-tools, in order to shorten mounting times. Notwithstanding the above, assembly may also be accomplished by means of conventional tools.

According to the present invention, there is provided a joint comprising :

- a female member having first and second ends internally threaded with threads having a round thread fillet shape;
- first and second male members, each having an end externally threaded with threads having a round thread fillet shape;
- the threaded end of the first male member joining the first end of the female member and the threaded end of the second male member joining the second end of the female member, for producing a joint;

said joint characterized in that said threads have a maximized length at each end of the male members;

said male members exhibiting, at extremities of the threaded ends, annular surfaces located in a perpendicular plane with respect to a joint axis, such that once the joint is formed, both annular surfaces make contact.

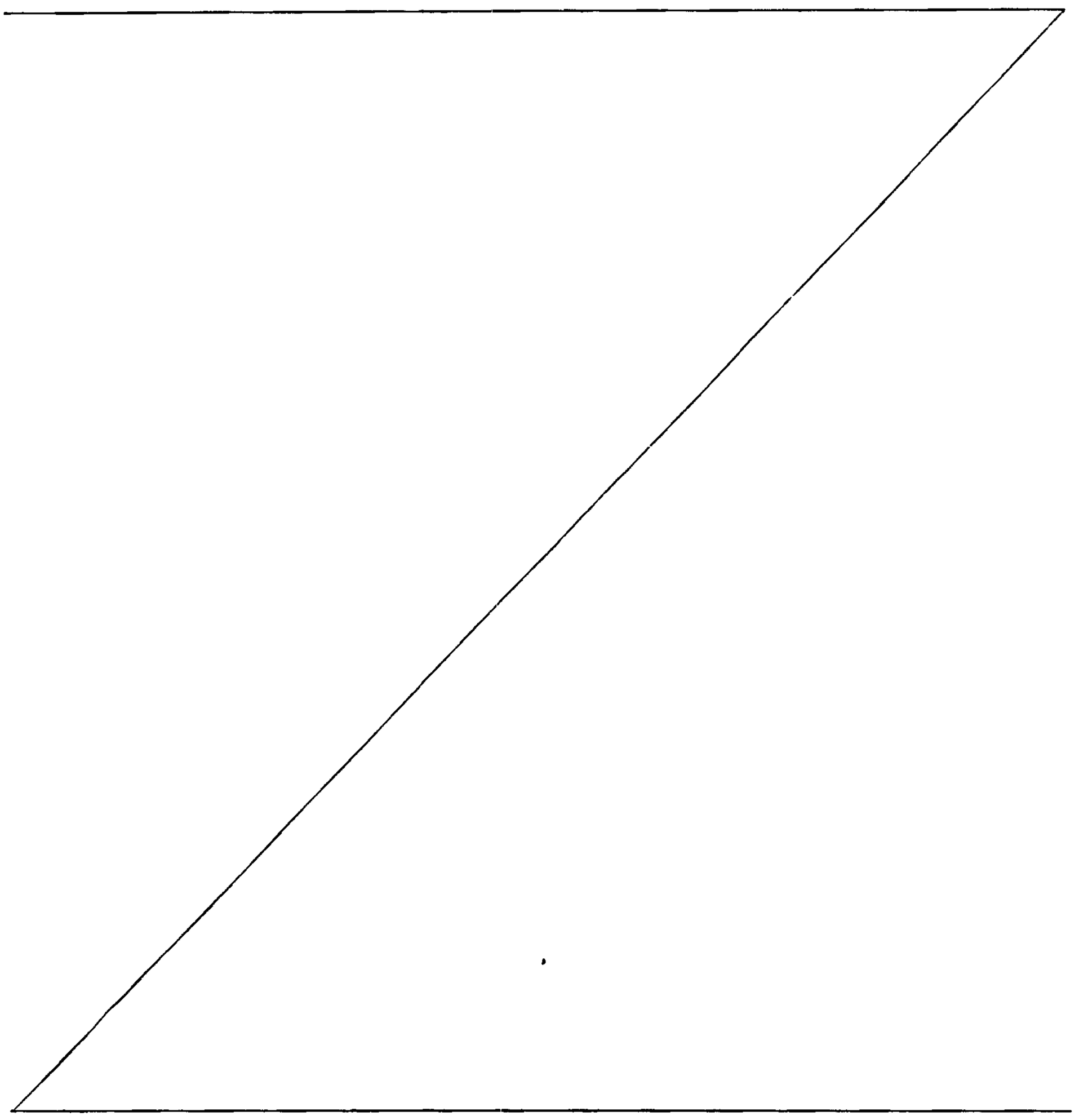
Preferably, also, each male end has, on the free end which adjoins the threaded surface, an annular surface perpendicularly located as regards the joint axis, in such a way that, once joined to the female thread, said annular surface contacts the homonymous annular surface of the other male end which joins the other female end. Combined effects of this axial length increase of the contact surface and the contact between male ends faces cause an increase of the joint jump-out resistance, as well as the resistance against a joint failure due to combined bending and tensile stresses, as compared to current joints.

Preferably, the procedure for the assembly of this joint comprises a first assembly between one of the male ends to one of the female ends up to a position such that the male free end is positioned at the intermediate section of the internally threaded member or coupling, with a certain position tolerance; then, the other male end is assembled to the corresponding female end until the annular surface located at the free end of this male end contacts the homonymous annular surface of the other male end, previously assembled. Once both annular surfaces contact each other, an additional force is applied in order to compress both male ends together, and causing, as an additional effect, stresses upon the member which houses female ends or coupling. Due to the particular assembly form of this joint, a continuity of internal diameters of the tubes which contain threaded male ends is produced, thus generating a continuity of the current line corresponding to the fluid circulating within said tubes.

Further, this joint can be provided with a central groove which is housed between both female ends, with the possibility of including a polymeric material ring in said groove in order to increase tightness thereof.

Preferably, as this joint seals by means of the threaded surface, a fluid is added which fills the interstices existent between roots and crests of said thread's fillets, in order to increase sealing capacity thereof. Said fluid may be a grease or an anaerobic type sealing substance.

Figures 1A, 1B and 1C show the configurations of a conventional joint such as that established by Standard API 5B, Figure 1A representing the assembled conventional joint, Figure 1B a male end and Figure 1C the female ends.



Figures 2A, 2B and 2C show the configurations of the joint with the modifications according to the present invention, wherein Figure 2A represents the inventive joint, Figure 2A a male end thereof and Figure 2C the female ends.

Figure 1A shows the conventional joint configuration after the assembly thereof. The discontinuity produced by the internal diameters at the joint central zone is shown.

Figure 1B shows the male end of the conventional joint with the thread length denoted as Lruc, and Figure 1C shows a schematic view of the coupling or member which comprises the female ends, in a conventional joint.

Figure 2A shows the joint with the modifications according to the invention, after the assembly thereof. It can be seen that the contact area between both members has been increased as regards what is shown in 1A. Also, the view shows the continuity of internal diameters at the joint central zone.

Figure 2B shows the male end of the joint according to the present invention, which thread length Lri has been increased as regards Lruc, and Figure 2C shows a schematic view of the member which comprises female ends or coupling, corresponding to the inventive joint. A central groove can be observed. Figure 2A shows the elements characterizing

the inventive joint, in the configuration corresponding to the assembly thereof.

There can be seen the two male ends (3.a and 3.b), connected to the corresponding female ends (1.a and 1.b), the latter constituting coupling (2). The union between the corresponding male and female ends is produced via the threaded surface (5.a. and 5.b). It can be seen that male ends are contacted through their annular surface in the vicinity of the free end thereof (6.a and 6.b). The free end (6.a) of one of the male ends, e.g. (3.a), which contacts the corresponding free end (6.b) of the other male end (3.b) is positioned in such a manner that it is approximately at the central area of coupling (2).

The position of groove (4) at the coupling central area can be seen. This can house a polymeric material ring.

The internal diameters continuity is clear in the assembly configuration. This internal diameters continuity produces a continuity of the circulating fluid current line, whereby the load loss due to the sharp section changes is decreased.

Figure 2B shows that the inventive thread length, denoted as Lri, extends up to the point in which thread (7) fades at the tube external diameter. The following table shows thread length according to modifications introduced by the invention.

Nominal Diameter (mm) - OD	Thickness - t (mm)	Lri (mm)
60.3≤OD<73.03	t≤4.37	>55
	4.37<t	>67
73.03≤OD<88.9	t≤4.78	>57
	4.78<t	>69
88.90≤OD<101.6	t≤4.78	>61
	4.78<t	>73
101.6≤OD<114.3	t≤4.78	>65
	4.78<t	>77
114.3≤OD<141.29	t≤4.78	>69
	4.78<t	>81
141.29≤OD<168.28	t≤5.56	>75
	5.56<t	>87
168.28≤OD<219.08	t≤5.56	>80
	5.56<t	>92
219.08≤OD<244.45	t≤5.56	>92
	5.56<t	>104
244.45≤OD	7.92≤t	>96

WHAT IS CLAIMED IS:

1. A joint comprising :

- a female member having first and second ends internally threaded with threads having a round thread fillet shape;

- first and second male members, each having an end externally threaded with threads having a round thread fillet shape;

the threaded end of the first male member joining the first end of the female member and the threaded end of the second male member joining the second end of the female member, for producing a joint;

said joint characterized in that said threads have a maximized length at each end of the male members;

said male members exhibiting, at extremities of the threaded ends, annular surfaces located in a perpendicular plane with respect to a joint axis, such that once the joint is formed, both annular surfaces make contact.

2. A joint according to claim 1, characterized in that it exhibits diameter tolerances such that a thread interference is diametrically smaller than 0.35 mm, and consequently, a required tightness torque will be always lower than 1355,818 N.m.

3. A joint according to claim 1, characterized in that it further comprises a central groove housed between said both female ends which may or may not house a polymeric material ring.

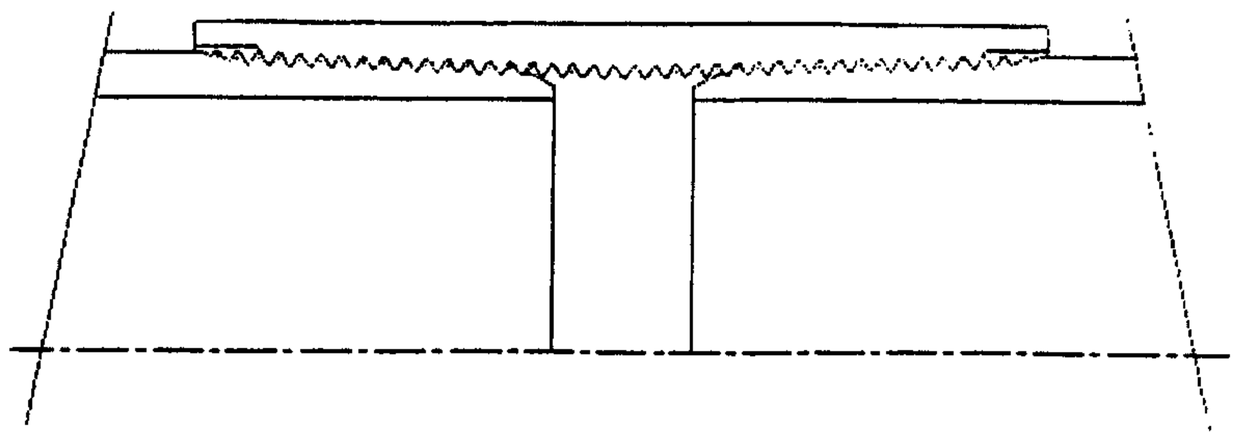


FIG. 1A

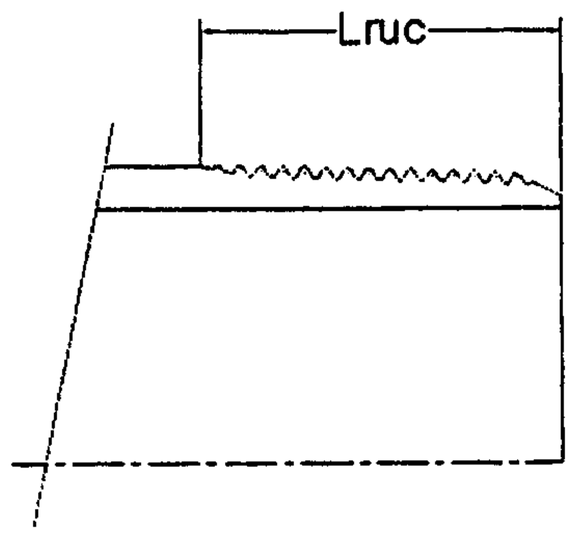


FIG. 1B

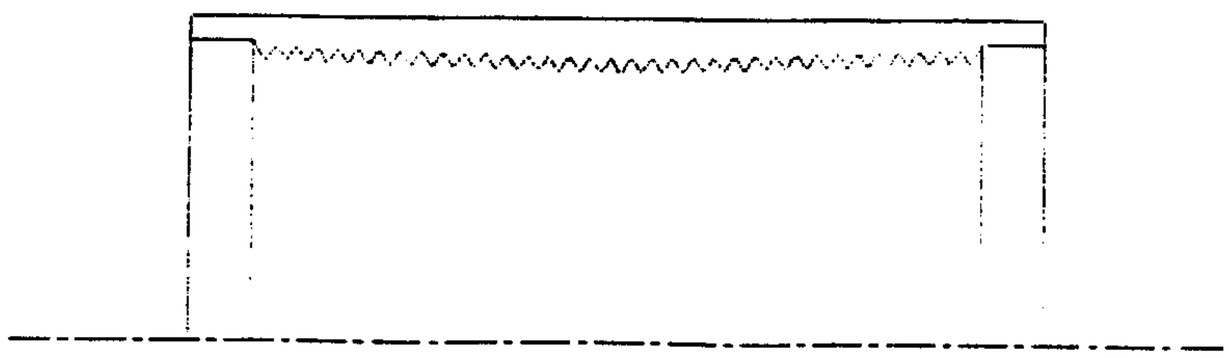


FIG. 1C

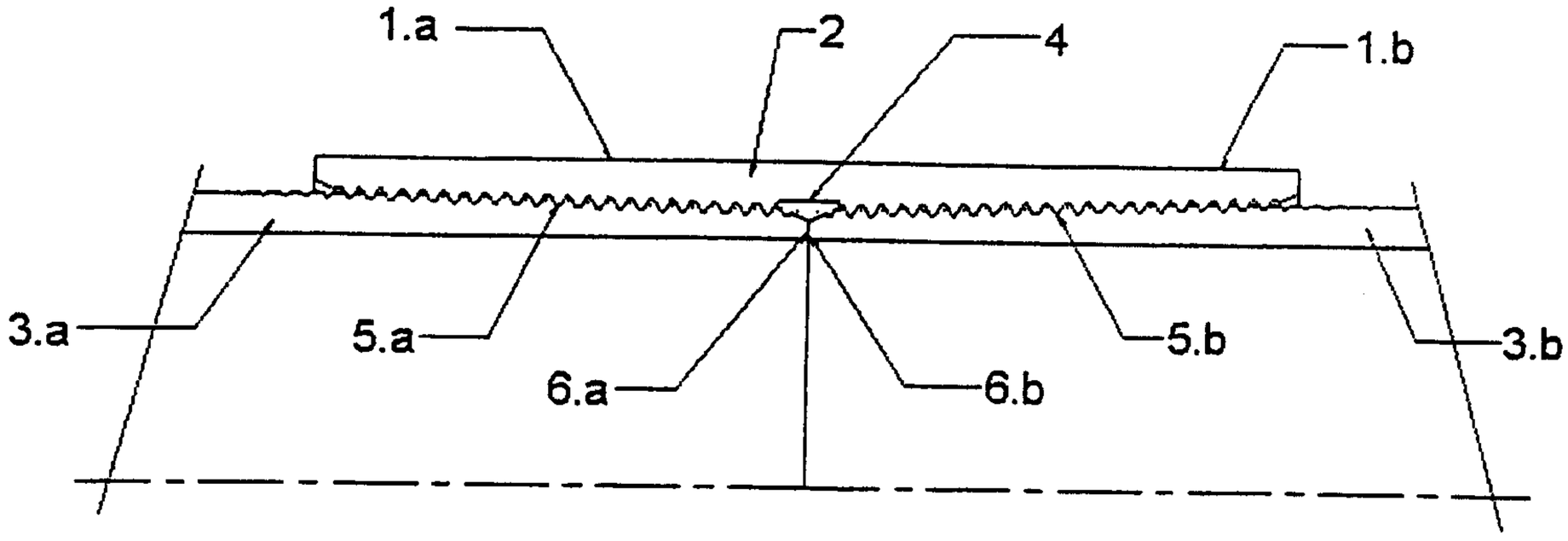


FIG. 2A

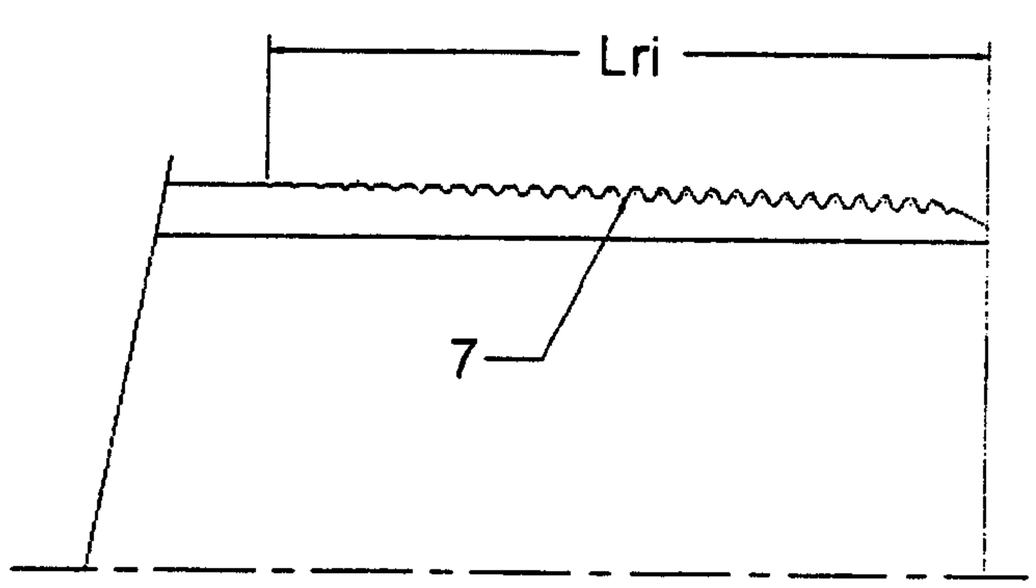


FIG. 2B

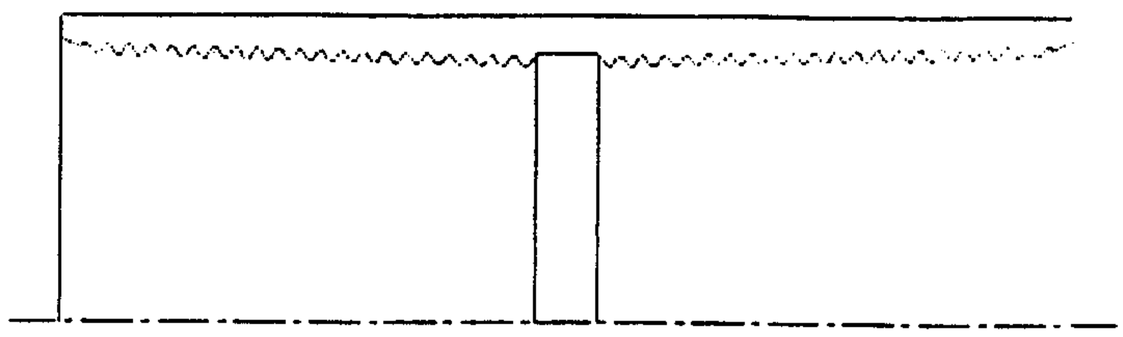
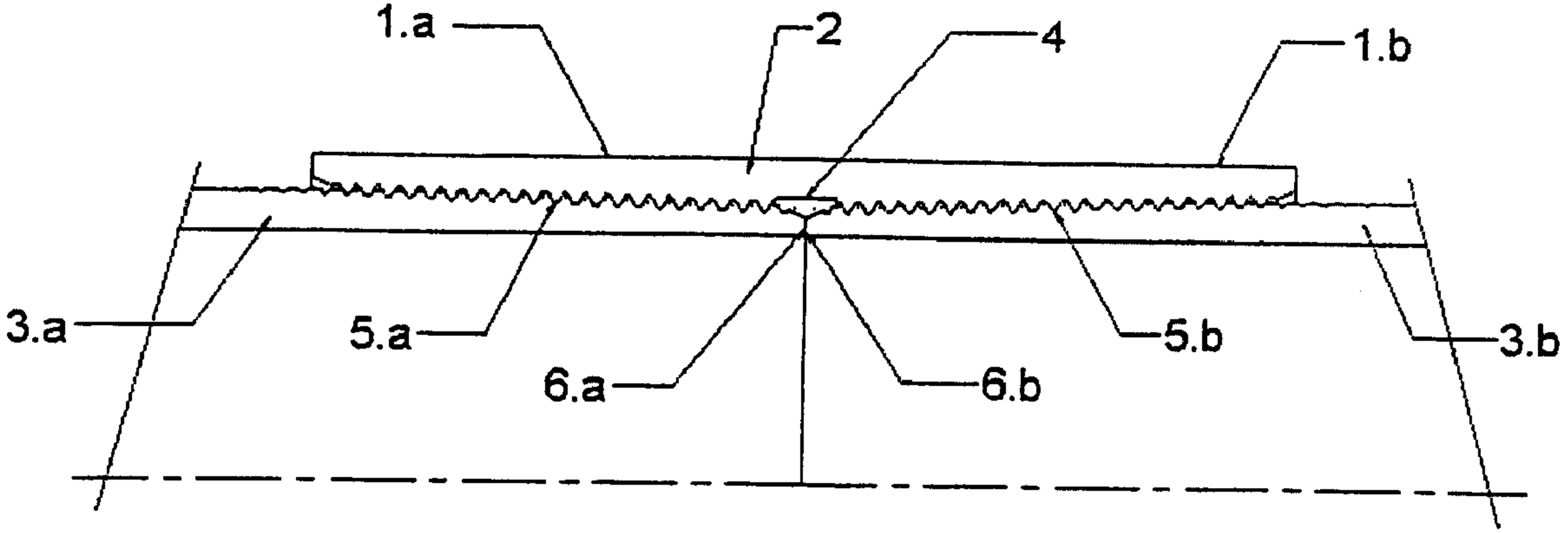


FIG. 2C


1.a
2
4
1.b
3.a
5.a
6.a
6.b
5.b
3.b